Guild LINE INSTRUMENTS LTD.
P. O. BOX 99
SMITHS FALLS, ONTARIO
TELEPHONE 283-3000

STANDARD CELL CERTIFICATE

Type No. 9152 Serial No. 22047

Thermostat Temp. 28 °C Thermocouple e.m.f. (cold junction at ice point) ..... mV

Cell 1 1.018251 ±5uV Abs. Volts at ..... °C

Cell 2 1.018251 ±5uV Abs. Volts at ..... °C

Cell 3 1.018242 ±5uV Abs. Volts at ..... °C

Cell 4 1.018250 ±5uV Abs. Volts at ..... °C

The following table gives the Saturated Standard Cadmium (acid) cell voltage at temperatures between 10°C and 40°C :

Temp. ° C	*Abs. Volts*	*Temp. ° C*	*Abs. Volts*
10	1.01889	26	1.01832
11	1.01887	27	1.01827
12	1.01885	28	1.01822
13	1.01883	29	1.01817
14	1.01880	30	1.01812
15	1.01877	31	1.01806
16	1.01874	32	1.01800
17	1.01871	33	1.01794
18	1.01867	34	1.01788
19	1.01863	35	1.01781
20	1.01859	36	1.01774
21	1.01855	37	1.01767
22	1.01851	38	1.01760
23	1.01847	39	1.01753
24	1.01842	40	1.01746
25	1.01837		

Signed : ..... Date OCTOBER 1961

3-61-1M – R. NEWS

MP MASTER
MA25775

Guildline Instruments Limited,
Smiths Falls, Ontario, Canada.

CONSTANT TEMPERATURE ENCLOSURE

TYPE 9152

OPERATING INSTRUCTIONS

SERIAL NO.....22047..... OPERATING TEMPERATURE .....28..... °C

The Type 9152 Constant Temperature Enclosure is intended to accommodate four Type 4305 saturated standard cells and to maintain a nominal temperature to within ±0.01C°.

The unit normally operates from 110V/60c/s mains but is also provided with standby facilities so that in the event of a mains failure, automatic change-over to 12 volt battery operation takes place. A 12 volt lead-acid battery should be connected to the "STANDBY 12V" terminals. The current taken from the battery is approximately 0.5 amp during the 'on' cycle.

A thermistor bridge is located in the same compartment as the standard cells and terminals are provided for the connection of a 1.5 volt cell and galvanometer. The bridge can be balanced by rotation of the dial on the control panel. This dial is engraved ±0.02C°. The galvanometer should have a current sensitivity of approximately 0.0005uA/mm.

...2

If NBS or NRC measurement of the standard cell potentials is required, the unit should be transported complete. The cells should not be removed from the enclosure. The absolute operating temperature is not guaranteed to better than ±0.25C° but the stability of operating temperature may be expected to be within ±0.01C° for the ambient temperature range mentioned below. The saturated cells have a negative temperature coefficient of between 40 and 50 ppm per Centigrade degree. A temperature change of 0.02C° is therefore equivalent to approximately 1 ppm on standard cell voltage. If the cells are to be certified by NBS or NRC, they should be certified in the enclosure.

The temperature of the standard cells may be expected to follow changes in room temperature with a ratio of change of approximately 1000; 1. For example, a change in ambient temperature of 5C° will change the bridge balance point by about 0.005C°.

After transportation the cells should be allowed to stabilise for at least 10 days before measurement or before use and if the enclosure has been allowed to cool, a similar waiting period should be allowed.

The enclosure can be expected to achieve normal operating temperature within 48 hours from cold.

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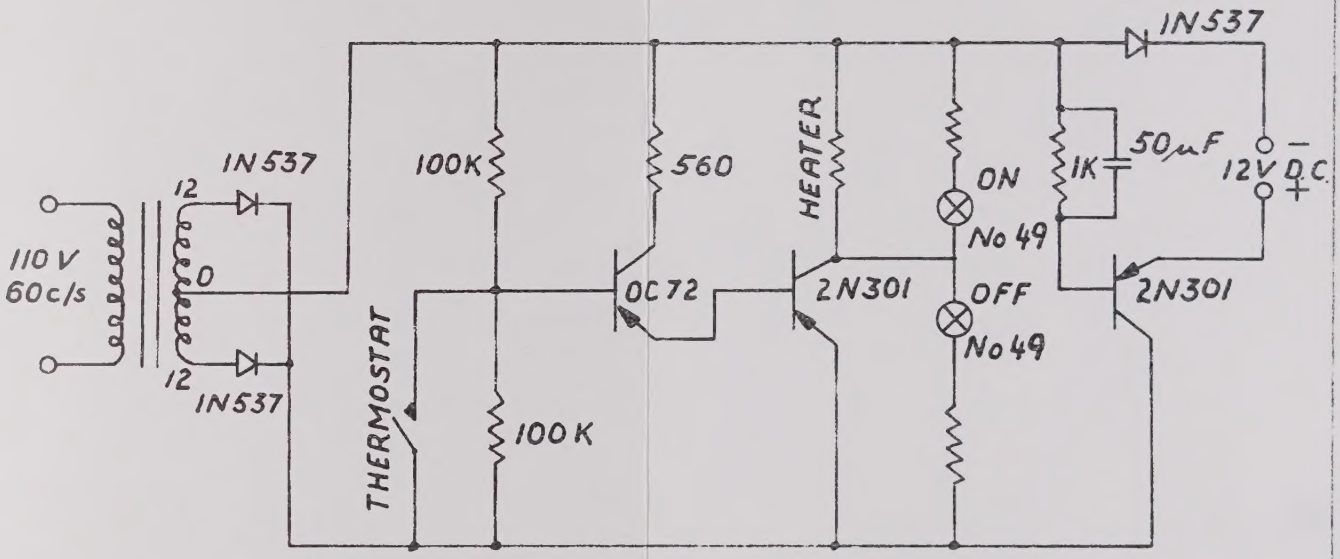
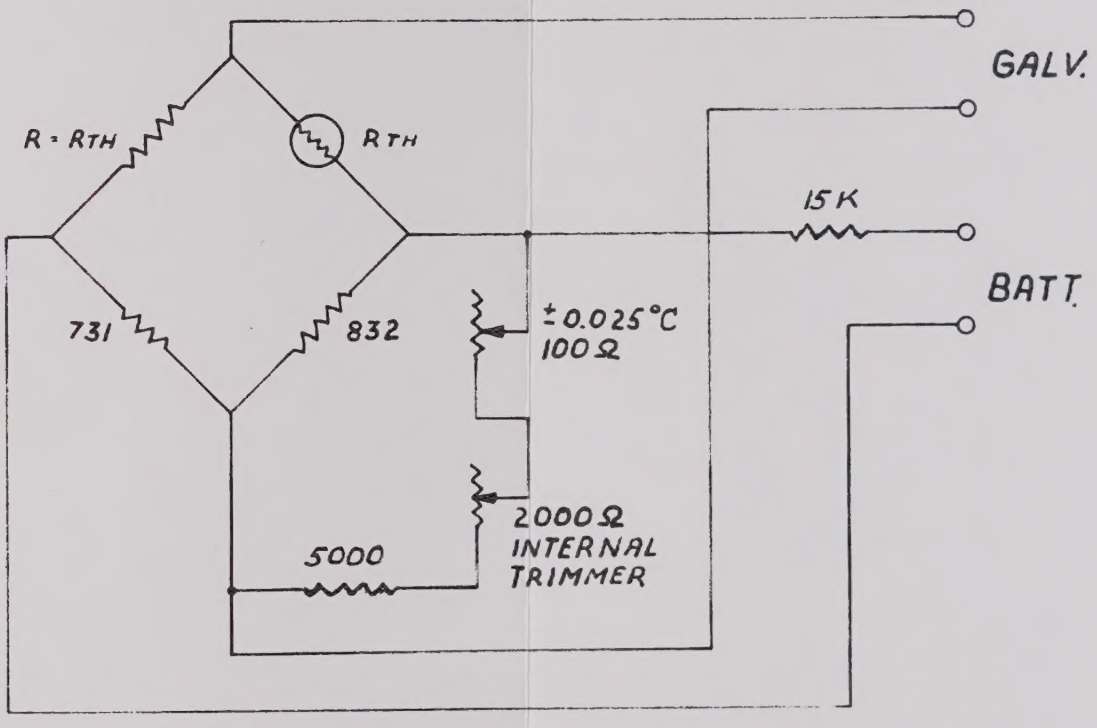


CONTROL CIRCUIT

STANDARD CELL
ENCLOSURE
TYPES 9152 + 9152A
ISSUE 3 AUG. 1961

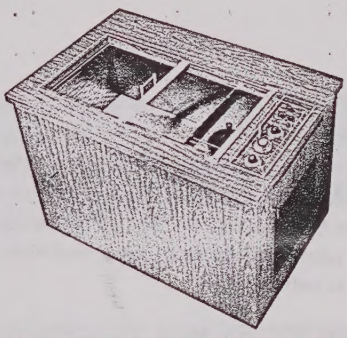


THERMISTOR BRIDGE

STANDARD CELL
ENCLOSURE
TYPES 9152 + 9152A
ISSUE 4 DEC. 1961

Accessory & Related Equipment

COMPATIBLE INSTRUMENTATION and ACCESSORIES



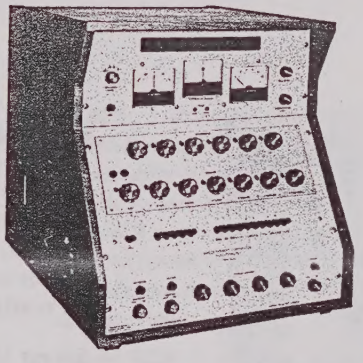
Temperature-Regulated Oil & Air Baths. Series 9730 Oil Baths are controlled to within ±0.001C° by unique solid-state, bistable-oscillator feedback circuit. Gradients as low as ±0.001C°. Various ranges, 0° to 100°C. Thermo-electric cooling. The Model 8000 is an extremely versatile Air Bath chamber providing almost 1000 cubic inches of space, and accommodating both passive and active components and circuits. Low gradient, 0.05C°. Twelve pairs of low-thermal feed-throughs. See Bulletin 6913.

Low-Thermal Selector Switches. Model 9145A is a 5-section, pushbutton Selector Switch intended for switching and reversing service in galvanometer and null-detector/amplifier circuits, or other circuits where spurious EMF's must be kept to the absolute minimum. Maximum generation of thermal EMF's is less than 0.01 microvolt. Model 9600 facilitates circuit reversals in potentiometer circuits. See Bulletin 6921.

Standard Cell Selector Switches. Model 9960/2) 102 is designed specifically for standard cell selection. Model 9415 "Intercheck" facilitates standard cell comparison. See Bulletin 6921.

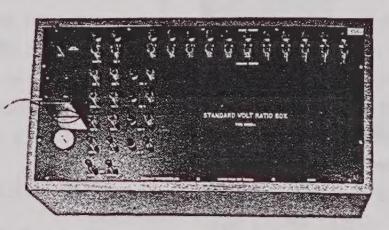
Low-Thermal Shielded Interconnection Cable. Type SCW. See Bulletin 6920.

RELATED INSTRUMENTATION



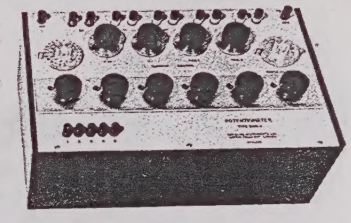
DC Current-Comparator Potentiometer. In Model 9930, rated accuracy, stability, and linearity **depend on turns ratio,** not on resistor characteristics. Calibration is permanent. Thermal EMF's, contact and lead resistances are negligible. Seven digits, three ranges, 0 to ±2.111,111,0V. Linearity better than 0.5 PPM of reading. See Bulletin 6911.

Preamplifier/Galvanometer Null Detectors. Model 9460A solid-state photo cell amplifier with wide-range gain, high stability, excellent noise and ripple rejection. Drives Model 9461A Display galvanometer. Together, maximum sensitivity of 3 picoamperes/mm with very low noise and drift. See Bulletin 6916.

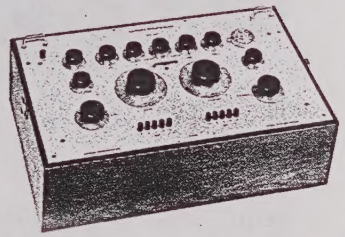


Volt Ratio Boxes. Series 9700. 0.15 or 1.5V to 750 or 1500 Volts, 15 to 25 taps, accuracies to ±5 or ±10 PPM. See Bulletin 6918.

Resistance Potentiometers.



Model 9160G. Fully guarded, 6 digits, low thermal EMF's. 5 PPM worst case accuracy. Three ranges: 0-2.111,110V. Used in a number of Calibration Console Systems (Series 9160GS). Self-calibrating.



Model 9144. 6-digit, Dauphinee design. ±0.5 PPM linearity; ±1.5 PPM/year stability. −10 μV to 2.101,010V range. Usable as resistance or standard cell comparator, 4-terminal variable resistor or 2-cell EMF standard. Self-calibrating.

Model 9176G. 6-digit, nanovolt, Dauphinee design. Three ranges to 0.121, 111,0V. 2 nanovolt residual thermal EMF's, compatibly high linearity and stability. Used in 9176GS systems for low-level measurements. Self-calibrating.

Model 9174. 4-digit microvolt potentiometer. 3 ranges to 10,000μV. 10 nanovolt/step resolution. Ideal for standard cell comparison. Self-calibrating.

Model 9120. 7 digits. 0-2.1 volts. Single-window readout. Ideal for QC/QA/Production calibrating and testing. Self-calibrating.

See Bulletin 6912 for all the above.

GUILDLINE INSTRUMENTS, INC.

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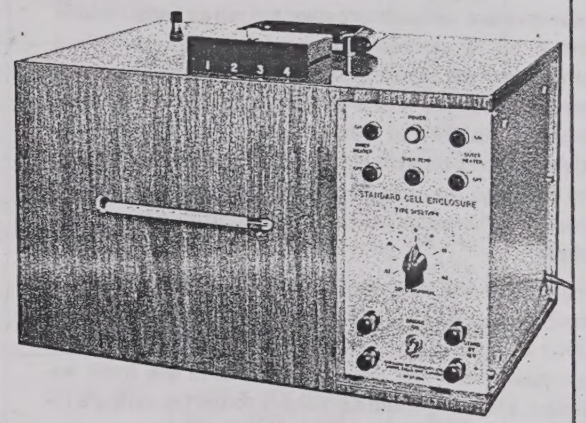
Series 9152
Standard Cell Enclosures
Model 9154
"TransVolt"® Transportable Standard-Cell Enclosures
Models MB3A/M2
Miniature Standard-Cell Enclosures

There are more Guildline Standard-Cell Enclosures in service than those of all other manufacturers combined. This position of leadership underscores, we believe, the superiority of both our designs and the meticulous quality of our workmanship. Further, the widespread acceptance of this family of equipment permits us to maintain **continuous** production of most models, reducing unit manufacturing cost — so that, despite their evident superiority, these enclosures are almost always the lowest-priced EMF standards of their kind.

Unquestionably, the most distinctive advantage of these enclosures over conventional designs is the exclusive (patented) Guildline temperature-regulating circuit, which derives its order-of-magnitude superiority in both sensitivity and stability from a solid-state bistable-oscillator feedback circuit. This circuit has a total band of uncertainty of the order of a few *millidegrees* Centrigrade, *including* long-term drift.

The responsiveness of this unique control system, when applied to the optimized thermo-mechanical structure of the Guildline enclosure, provides near-ideal environmental protection for the special invertible saturated EMF cells used throughout this family. These cells are "pedigreed" through months of stabilization and monitoring, and have been selected for closest match and highest predictable stability, as reference to our specified guarantees will demonstrate.



FEATURES (9152 Series)

Temperature stability better than ±0.01C° for five years.

•

Temperature monitor built in.

•

Automatic 12 volt battery operation in case of line power failure.

•

Automatic overtemperature protection.

•

Fully transportable, under battery power if required.

•

Shipment by commercial carriers possible — cells are invertible.

•

Available with 4, 6, 10 or 12 saturated standard cells.

FEATURES (9154)

Self-Contained Rechargeable Batteries and Integral Charger (continuous AC operation between trips)

•

Compact, Lightweight Structure, and Fitted Transit Case (about the size and weight of a portable typewriter) Designed For Common Carrier Shipment.

GUILDLINE *Modern Electronic Metrology*

MP MASTER
MA25775